

## ORIGINAL RESEARCH

## THE RELIABILITY OF THE MODIFIED REVERSE-6 TAPING PROCEDURE WITH ELASTIC TAPE TO ALTER THE HEIGHT AND WIDTH OF THE MEDIAL LONGITUDINAL ARCH

Mark W. Cornwall, PT, PhD, CPed, FAPTA<sup>1</sup>Michael Lebec, PT, PhD<sup>1</sup>Julie DeGeyter, PT, DPT<sup>1</sup>Thomas G. McPoil, PT, PhD, FAPTA<sup>2</sup>

## ABSTRACT

**Purpose/Background:** Anti-pronation-taping utilizing both inelastic and elastic tape has been advocated to reduce pain and symptoms associated with excessive foot pronation. An important question regarding the use of taping is whether it can be applied consistently from one therapist to the next, from one session to the next or from one day to the next. Thus, the purpose of this study was to determine whether the “modified” Reverse-6 taping procedure using elastic tape could be applied to produce a consistent within-day and between-day change in the height and width of the medial longitudinal arch for a single clinician as well as between clinicians. A second purpose was to determine if the amount of general clinical experience influenced this consistency.

**Methods:** Fifteen asymptomatic individuals (10 female and 5 male) with a mean age of 28.7 years were recruited to participate in this study. The height and width of the midfoot at 50% of each subject's foot length was measured in standing using a digital gauge and caliper. These measurements were done twice on the same day, on two different days and again by two clinicians with different levels of experience before and after having their feet taped using the “modified” Reverse-6 taping technique using elastic tape. Both clinicians received a one-hour training session on how to apply the taping technique and were also given a DVD showing the technique that they could review. In addition to descriptive statistics, intra-class correlation coefficients (ICC) were used to assess each clinician's within-day and between-day reliability. Between-clinician reliability was also determined.

**Results:** The mean dorsal arch height and midfoot width before the application of tape was 62.7 and 78.9 mm. The mean dorsal arch height and width after the application of tape was 66.6 and 78.8 mm. The within-day reliability ICC<sub>(2,1)</sub> values for the two clinicians ranged from .865 to .991. The between-day reliability ICC<sub>(2,1)</sub> values for the two clinicians ranged from .874 to .985. The between-clinician reliability ICC<sub>(2,1)</sub> values ranged from .918 to .993.

**Conclusions:** The results of this study indicate that the “modified” Reverse-6 foot taping technique using elastic tape can be used by more than one therapist for the same patient as well as from one session to the next with excellent reliability.

**Level of Evidence:** Level 2, Prospective Cohort Study

**Keywords:** Adhesive taping, foot and ankle, reliability

## CORRESPONDING AUTHOR

Mark W. Cornwall, PT, PhD, CPed, FAPTA  
Department of Physical Therapy and Athletic  
Training  
P.O. Box 15105  
Northern Arizona University  
Flagstaff, Arizona 86011  
928-523-1606  
Email: mark.cornwall@nau.edu

<sup>1</sup> Northern Arizona University, Flagstaff, AZ, USA

<sup>2</sup> Regis University, Denver, CO, USA

The Institutional Review Board at Northern Arizona University, Flagstaff, AZ, approved this study.

## INTRODUCTION

Anti-pronation taping has been advocated as a method to reduce pain and symptoms caused by excessive foot pronation.<sup>1-5</sup> Although several different taping techniques have been described to limit foot pronation, the “low-dye” and “Reverse-6” have received the greatest attention. The low-dye technique was described by Dr. Ralph Dye and has been shown to increase the height of the medial longitudinal arch<sup>4,6-8</sup> and also provide short-term relief of symptoms associated with plantar fasciitis.<sup>1,3,9,10</sup> The Reverse-6 taping technique has also been used to control excess foot pronation.<sup>5,11,12</sup> In a recent systematic review, Cheung et al<sup>2</sup> reported that while adhesive taping was more effective than footwear and foot orthoses in controlling foot pronation, the low-Dye technique was less effective than other taping techniques such as the Reverse-6 that is applied above the talocrural joint. Although control of foot pronation is more effective when the tape is applied above the talocrural joint, the Reverse-6 technique that was originally described by Vicenzino et al covered both malleoli.<sup>5</sup> Previous research has indicated that talocrural joint range of motion, especially plantar flexion, may be restricted too much when tape is applied over the malleoli.<sup>13</sup>

Inelastic tape has been used almost exclusively in order to control foot pronation and restrict foot movement.<sup>1,4,14,15</sup> Only one study has been published in which elastic tape was used to restrict motion of the medial longitudinal arch. This study was a case series and the authors reported that the use of a “modified” Reverse-6 taping technique using elastic tape reduced symptoms associated with foot pronation for a variety of foot and lower extremity

disorders. In addition, the change in foot posture created by the “modified” Reverse-6 taping technique could also be used to determine the degree of orthotic posting.<sup>12</sup> In that study, the original Reverse-6 taping technique described by Vicenzino et al<sup>5</sup> was modified by first altering the path of the tape so that it did not cross the medial or lateral malleoli and therefore would not cause any reduction in talocrural joint range of motion and second by using elastic rather than inelastic tape.<sup>12</sup> While the Meier et al case study series demonstrated that the “modified” Reverse-6 (MR6) taping technique was clinically effective, it is still critical to understand if it can be reliably applied in order to produce a consistent change in the height and width of the medial longitudinal arch from one session to the next, from one day to the next, and from one clinician to the next. Thus, the purpose of this study was to determine whether the “modified” Reverse-6 taping procedure using elastic tape could be applied to produce a consistent within-day and between-day change in the height and width of the medial longitudinal arch for a single clinician as well as between clinicians. A second purpose was to determine if the amount of general clinical experience influenced this consistency.

## METHODS

Fifteen individuals (10 women, 5 men) with a mean age of 28.7 years and without a history of injury or pain to either of their feet for at least 6 months prior to participating in the study were recruited (Table 1). The Internal Review Board at Northern Arizona University approved the study and all of the subjects read and signed an informed consent prior to participating.

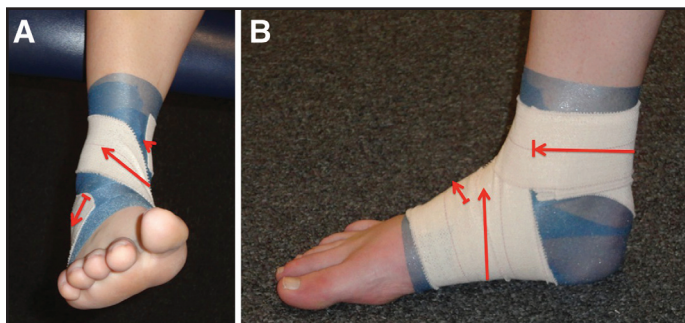
**Table 1.** Demographic Information on the Subjects Used in the Study. Values in Parentheses are Standard Deviations.

	Age (yrs)	Height (cm)	Weight (kg)	Foot Posture Index
Female (n=5)	28.3 (9.9)	168.2 (5.7)	65.5 (9.6)	1.70 (4.0)
Male (n=10)	30.2 (7.9)	174.8 (6.9)	72.6 (9.6)	1.50 (3.4)
Total (n = 15)	28.9 (8.8)	170.4 (6.7)	67.9 (9.9)	1.63 (3.8)

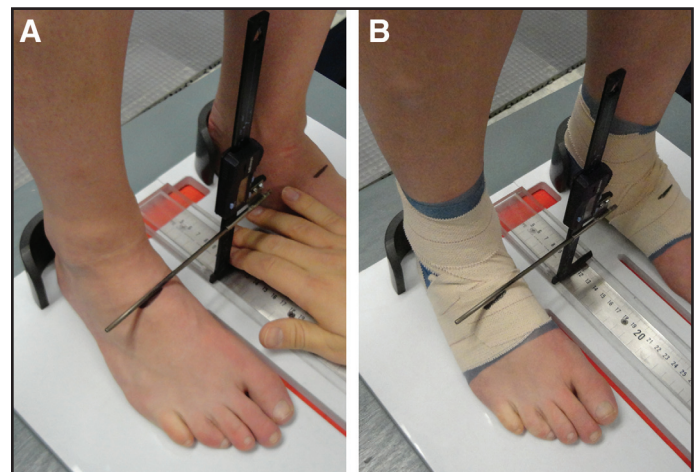
The taping technique used in this study was the same as described by Meier, et al and utilized elastic tape (Elastakon®, Johnson & Johnson, New Brunswick, NJ).<sup>12</sup> See Figure 1. The taping technique was applied to both feet of each subject by two different individuals. One of the individuals was a licensed physical therapist with 14 years of experience treating a wide variety of orthopedic conditions and although he had previously used the MR6 taping technique for approximately two years, it was not on a regular basis. The other individual was a graduate student in physical therapy who did not have formal training in the application or use of the MR6 taping technique prior to participating in the study. Each person serving as the “clinician” received a one-hour training session in the proper application of the MR6 taping technique by one of the authors (MWC) of this study who was a licensed physical therapist with over 30 years of clinical experience, including frequent application of the MR6 taping procedure. This training consisted of both verbal instruction and demonstration. Each person was also provided with a video of the taping procedure and allowed to review the video as much as they wished. Finally, the clinicians returned one week after the initial training session where they were observed applying the tape to an individual in order to ensure proper application. Each person who served as a clinician for this study received the same training regardless of his or her prior use of the taping technique.

After measuring each subject's height and weight, the Foot Posture Index (FPI) for each of the subject's feet was assessed to using the methods described by

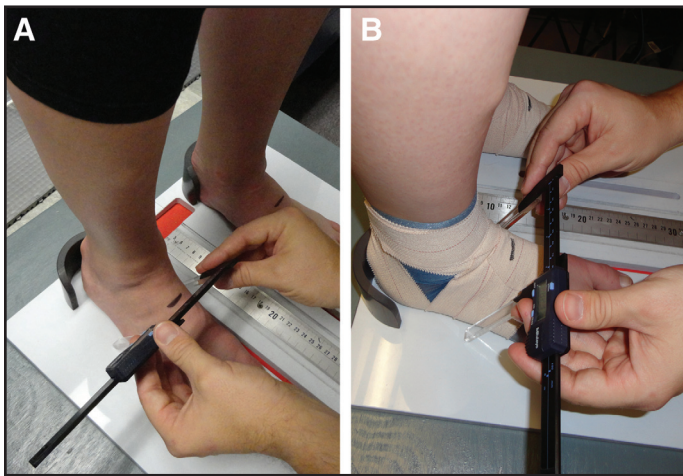
Redmond.<sup>16</sup> The FPI is obtained by visually rating six different foot postures on a scale from -2 to +2 and then summing all scores to obtain a single value between -12 and +12. Negative values denote a supination posture whereas positive values denote a pronation posture. The normal FPI value for healthy individuals ranges from +1 to +7.<sup>16</sup> The FPI has been shown to have good intra-clinician reliability (ICC = .928 to .937) and moderate inter-clinician reliability (ICC = .525 to .655).<sup>17</sup> Next, each subject was asked to stand on both feet on a foot measurement platform that was created and described by McPoil et al.<sup>18,19</sup> Using this platform, the height of the dorsum of the arch (DAH) and the width of the midfoot (MFW) was measured (bilaterally) using a digital caliper with a resolution of .01 mm (Mitutoyo America Corporation, Aurora, IL) at 50% of the subject's overall foot length. See Figures 2 and 3. All measurements of dorsal arch height and midfoot width were performed by a laboratory technician with extensive experience doing the measurements and used the methods described by McPoil, et al which have been shown to be reliable.<sup>19</sup> The subjects were then randomly assigned to one of the two clinicians in the study who applied the tape to the feet using the MR6 taping technique and elastic tape. Immediately following the application of the tape, the subject's dorsal arch height and midfoot width was measured bilaterally, again on the platform, during bilateral stance. After the second set of measurements, the tape was removed and any markings on the skin were removed with isopropyl alcohol. After



**Figure 1.** Illustration of the Modified Reverse-6 Taping Technique Using Elastic Tape Used in the Study. A) Single strip of tape applied starting on the lateral aspect of the foot and ending above the malleolus. B) Completed Modified Reverse-6 technique using 3 strips plus an inversion “heel lock”.



**Figure 2.** Illustration of the Method Used to Measure Dorsal Arch Height before (A) and after (B) application of the tape.



**Figure 3.** Illustration of the Method Used to Measure Mid-foot Width before (A) and after (B) application of the tape.

approximately 15 minutes, the above procedure was repeated with the same clinician. All of the subjects then returned one week later where the entire above procedure was repeated except that their feet were taped by the other clinician.

### STATISTICAL METHODS

Descriptive statistics were used to describe subject demographics as well as the magnitude of the change in dorsal arch height and midfoot width following the application of the MR6 taping technique. Independent t-tests were used to assess if there was a statistically significant difference in the within-day or between-day measurements of each clinician as well as the measurements between the two clinicians. An alpha level of .05 was used for all tests of statistical significance. Intra-class correlation coefficients (ICC; 2,1) were calculated to assess each clinician's within-day and between-day reliability.<sup>20</sup> In addition, ICC values were used to assess between-clinician reliability. Intra-class correlation coefficients were interpreted and classified using the arbitrary scale suggested by Landis and Koch.<sup>21</sup> Standard error of the measurement (SEM) was also calculated to assess the precision of the measurements.

### RESULTS

The mean FPI score for the subjects in this study was +1.6 (SD=3.9) for the left foot and +1.7 (SD=3.8) for the right foot. The mean height of the dorsal arch before the application of the tape was 61.9 mm (SD=4.4) and 63.5 mm (SD=4.1) for the left and

right feet respectively. Immediately after the tape was applied, the dorsal arch height was 66.0 mm (SD=4.4) and 67.3 mm (SD=3.9) for the left and right feet respectively. The mean increase in the height of the arch was 4.3 mm for the left feet and 4.0 mm for the right feet. Each of these was found to be statistically significant ( $p=0.000$ ; power=.94). The mean width of the midfoot before the application of the tape was 79.1 mm (SD=8.8) and 78.8 mm (SD=7.9) for the left and right feet respectively. Immediately after the tape was applied, the width of the midfoot was 79.0 mm (SD=7.5) and 78.5 mm (SD=6.6) for the left and right feet respectively. The mean decrease in the width of the midfoot was 0.1 mm for the left feet and 0.3 mm for the right feet. Neither of these was found to be statistically significant ( $p=.849$  and  $p=.644$ ; power=.05). The mean arch height and midfoot width for each clinician and on each day is found in tables 2 and 3. A series of independent t-tests indicated that there was no significant difference between the left and right feet for the height of the dorsal arch between trials ( $p=0.296$ ). In addition, no significant difference ( $p=0.334$ ) was found between the two clinicians for the within-day measurements of arch height. Finally, no statistically significant difference ( $p=0.707$ ) was found between the two clinicians for measurements of arch height.

Note: All mean reliability results in this section will be reported as the ICC's or SEM's of the combined left and right feet, rather than reporting the left and right results independently.

### Within-Day Reliability

The within-day ICC and SEM values for DAH and MFW measurements of both the left and right feet for each clinician and each day are found in tables 4 and 5. The overall within-day mean ICC value for pre- and post-tape DAH for Clinician 1 was 0.893 and 0.940 respectively. The overall within-day mean SEM value for pre- and post-tape DAH for Clinician 1 was 1.5 mm and 1.1 mm respectively. The overall within-day mean ICC value for pre- and post-tape DAH for Clinician 2 was 0.925 and 0.934 respectively. The overall within-day mean SEM value for pre- and post-tape DAH for Clinician 2 was 1.2 mm and 1.1 mm respectively. The overall within-day mean ICC value for pre- and post-tape MFW for Clinician 1 was 0.984

**Table 2.** Mean Dorsal Arch Height and Midfoot Width Values in Millimeters, for the Left and Right Extremity for Clinician 1 and Each Day of Testing. Values in Parentheses are Standard Deviations.

CLINICIAN 1							
DAY 1							
ARCH HEIGHT				MIDFOOT WIDTH			
Left		Right		Left		Right	
Pre-Tape	Post-Tape	Pre-Tape	Post-Tape	Pre-Tape	Post-Tape	Pre-Tape	Post-Tape
62.0 (4.5)	66.1 (4.5)	61.9 (4.5)	65.6 (4.7)	78.5 (8.3)	78.5 (7.1)	79.0 (8.5)	79.3 (7.0)
DAY 2							
ARCH HEIGHT				MIDFOOT WIDTH			
Left		Right		Left		Right	
Pre-Tape	Post-Tape	Pre-Tape	Post-Tape	Pre-Tape	Post-Tape	Pre-Tape	Post-Tape
61.9 (4.5)	66.1 (3.9)	61.8 (4.1)	66.2 (4.4)	79.3 (9.1)	79.4 (8.0)	79.5 (9.5)	79.4 (7.9)

**Table 3.** Mean Dorsal Arch Height and Midfoot Width Values in Millimeters, for the Left and Right Extremity for Clinician 2 and Each Day of Testing. Values in Parentheses are Standard Deviations.

CLINICIAN 2							
DAY 1							
ARCH HEIGHT				MIDFOOT WIDTH			
Left		Right		Left		Right	
Pre-Tape	Post-Tape	Pre-Tape	Post-Tape	Pre-Tape	Post-Tape	Pre-Tape	Post-Tape
63.7 (5.1)	67.0 (3.9)	63.8 (3.7)	67.5 (4.0)	78.8 (7.8)	78.9 (6.4)	78.3 (7.4)	78.7 (6.2)
DAY 2							
ARCH HEIGHT				MIDFOOT WIDTH			
Left		Right		Left		Right	
Pre-Tape	Post-Tape	Pre-Tape	Post-Tape	Pre-Tape	Post-Tape	Pre-Tape	Post-Tape
63.5 (4.4)	68.0 (4.1)	63.1 (4.3)	67.5 (4.0)	78.9 (8.2)	78.9 (6.9)	78.9 (8.1)	78.5 (6.9)

and 0.985 respectively. The overall within-day mean SEM value for pre- and post-tape MFW for Clinician 1 was 1.1 mm and 0.9 mm respectively. The overall within-day mean ICC value for pre- and post-tape MFW for Clinician 2 was 0.976 and 0.984 respectively. The overall within-day mean SEM value for

pre- and post-tape DAH for Clinician 2 was 1.2 mm and 0.9 mm respectively.

#### Between-Day Reliability

The between-day ICC coefficients and SEM values for DAH and MFW measurements of both the left

**Table 4.** Within-Day Intra-class Correlation Coefficients, 95% Confidence Interval, and Standard Error of the Measure for Dorsal Arch Height (DAH) of the Left and Right Feet.

		ICC	95% CI	SEM
<b>DAY 1 – CLINICIAN 1</b>				
Pre-Tape	Left	.901	.731 to .966	1.5 mm
	Right	.884	.689 to .959	1.5 mm
Post-Tape	Left	.948	.852 to .982	1.1 mm
	Right	.952	.864 to .984	0.9 mm
<b>DAY 2 – CLINICIAN 1</b>				
Pre-Tape	Left	.920	.769 to .973	1.3 mm
	Right	.865	.631 to .954	1.7 mm
Post-Tape	Left	.912	.750 to .971	1.2 mm
	Right	.948	.846 to .983	1.0 mm
<b>CLINICIAN 1 OVERALL</b>				
Pre-Tape	-	.893	-	1.5 mm
Post-Tape	-	.940	-	1.1 mm
<b>DAY 1 – CLINICIAN 2</b>				
Pre-Tape	Left	.935	.818 to .978	1.2 mm
	Right	.936	.821 to .978	1.0 mm
Post-Tape	Left	.936	.821 to .978	1.2 mm
	Right	.971	.916 to .990	0.7 mm
<b>DAY 2 – CLINICIAN 2</b>				
Pre-Tape	Left	.870	.645 to .957	1.5 mm
	Right	.957	.871 to .986	0.9 mm
Post-Tape	Left	.927	.790 to .976	1.2 mm
	Right	.901	.720 to .967	1.3 mm
<b>CLINICIAN 2 OVERALL</b>				
Pre-Tape	-	.925	-	1.2 mm
Post-Tape	-	.934	-	1.1 mm

and right feet for each clinician are found in tables 6 and 7. The overall between-day mean ICC value for pre- and post-tape DAH for Clinician 1 was 0.927 and 0.948 respectively. The overall between-day mean SEM value for pre- and post-tape DAH for Clinician 1 was 1.1 mm and 1.0 mm respectively. The overall between-day mean ICC value for pre- and post-tape DAH for Clinician 2 was 0.937 and 0.939 respectively. The overall between-day mean SEM value for pre- and post-tape DAH for Clinician 2 was 1.1 mm and 1.1 mm respectively. The overall between-day mean ICC value for pre- and post-tape MFW for Clinician 1 was 0.981 and 0.980 respectively. The overall between-day mean SEM value for pre- and post-tape

MFW for Clinician 1 was 1.2 mm and 1.1 mm respectively. The overall between-day mean ICC value for pre- and post-tape MFW for Clinician 2 was 0.974 and 0.980 respectively. The overall between-day mean SEM value for pre- and post-tape MFW for Clinician 2 was 1.4 mm and 1.0 mm respectively.

#### **Between-Clinician Reliability**

The between-clinician ICC coefficients and SEM values for DAH and MFW measurement of both the left and right feet for each day are found in tables 8 and 9. The overall between-clinician mean ICC value for pre- and post-tape DAH for Day 1 was 0.938 and 0.973 respectively. The overall between-clinician

**Table 5.** Between-Trial Intra-class Correlation Coefficients, 95% Confidence Interval, and Standard Error of the Measure for Midfoot Width (MFW) of the Left and Right Feet.

		ICC	95% CI	SEM
<b>DAY 1 – CLINICAN 1</b>				
Pre-Tape	Left	.978	.935 to .992	1.3 mm
	Right	.991	.974 to .997	0.8 mm
Post-Tape	Left	.988	.965 to .998	0.8 mm
	Right	.987	.961 to .996	0.7 mm
<b>DAY 2 – CLINICAN 1</b>				
Pre-Tape	Left	.986	.958 to .996	1.1 mm
	Right	.981	.942 to .994	1.1 mm
Post-Tape	Left	.986	.957 to .995	1.0 mm
	Right	.979	.937 to .993	1.0 mm
<b>CLINICIAN 1 OVERALL</b>				
Pre-Tape	-	.984	-	1.1 mm
Post-Tape	-	.985	-	0.9 mm
<b>DAY 1 – CLINICAN 2</b>				
Pre-Tape	Left	.988	.964 to .996	0.9 mm
	Right	.941	.835 to .980	1.8 mm
Post-Tape	Left	.979	.938 to .993	1.0 mm
	Right	.984	.952 to .995	0.8 mm
<b>DAY 2 – CLINICAN 2</b>				
Pre-Tape	Left	.994	.980 to .998	0.8 mm
	Right	.983	.947 to .994	1.1 mm
Post-Tape	Left	.986	.957 to .995	0.9 mm
	Right	.987	.959 to .996	0.9 mm
<b>CLINICIAN 2 OVERALL</b>				
Pre-Tape	-	.976	-	1.2 mm
Post-Tape	-	.984	-	0.9 mm

mean SEM value for pre- and post-tape DAH for Day 1 was 0.7 mm and 0.7 mm respectively. The overall between-clinician mean ICC value for pre- and post-tape DAH for Day 2 was 0.998 and 0.998 respectively. The overall between-clinician mean SEM value for pre- and post-tape DAH for Day 2 was 0.6 mm and 0.8 mm respectively. The overall between-clinician mean ICC value for pre- and post-tape MFW for Day 1 was 0.985 and 0.991 respectively. The overall between-clinician mean SEM value for pre- and post-tape MFW for Day 1 was 1.0 mm and 0.7 mm respectively. The overall between-clinician mean ICC value for pre- and post-tape MFW for Day 2 was 0.999 and

0.999 respectively. The overall between-clinician mean SEM value for pre- and post-tape MFW for Day 2 was 0.7 mm and 0.8 mm respectively.

## DISCUSSION

Using the classification system proposed by Landis and Koch<sup>21</sup>, each of the ICC values obtained in this study would be characterized as “almost perfect”. As such, the results of this study indicate that the MR6 taping technique using elastic tape can be applied consistently from one trial to the next, from one day to the next, as well as between different clinicians.

**Table 6.** Between-Day Intra-class Correlation Coefficients, 95% Confidence Interval, and Standard Error of the Measure for Dorsal Arch Height (DAH) of the Left and Right Feet.

		ICC	95% CI	SEM
<b>CLINICIAN 1</b>				
Pre-Tape	Left	.980	.940 to .994	0.6 mm
	Right	.874	.653 to .958	1.5 mm
Post-Tape	Left	.949	.848 to .983	1.0 mm
	Right	.947	.844 to .983	0.9 mm
<b>CLINICIAN 1 OVERALL</b>				
Pre-Tape	-	.927	-	1.1 mm
Post-Tape	-	.948	-	1.0 mm
<b>CLINICIAN 2</b>				
Pre-Tape	Left	.946	.842 to .982	1.0 mm
	Right	.928	.792 to .976	1.1 mm
Post-Tape	Left	.946	.872 to .986	1.0 mm
	Right	.932	.802 to .978	1.1 mm
<b>CLINICIAN 2 OVERALL</b>				
Pre-Tape	-	.937	-	1.1mm
Post-Tape	-	.939	-	1.1mm

**Table 7.** Between-Day Intra-class Correlation Coefficients, 95% Confidence Interval, and Standard Error of the Measure for Midfoot Width (MFW) of the Left and Right Feet.

		ICC	95% CI	SEM
<b>CLINICIAN 1</b>				
Pre-Tape	Left	.980	.939 to .994	1.2 mm
	Right	.982	.946 to .994	1.1 mm
Post-Tape	Left	.975	.925 to .992	1.4 mm
	Right	.985	.953 to .995	0.8 mm
<b>CLINICIAN 1 OVERALL</b>				
Pre-Tape	-	.981	-	1.2 mm
Post-Tape	-	.980	-	1.1 mm
<b>CLINICIAN 2</b>				
Pre-Tape	Left	.979	.937 to .993	1.3 mm
	Right	.968	.904 to .990	1.4 mm
Post-Tape	Left	.973	.917 to .991	1.2 mm
	Right	.986	.956 to .995	0.8 mm
<b>CLINICIAN 2 OVERALL</b>				
Pre-Tape	-	.974	-	1.4 mm
Post-Tape	-	.980	-	1.0 mm

**Table 8.** Between-Clinician Intra-class Correlation Coefficients, 95% Confidence Interval, and Standard Error of the Measure for Dorsal Arch Height (DAH) of the Left and Right Feet.

		ICC	95% CI	SEM
<b>DAY 1</b>				
Pre-Tape	Left	.957	.878 to .985	0.9 mm
	Right	.918	.775 to .972	1.3 mm
Post-Tape	Left	.980	.942 to .993	0.7 mm
	Right	.966	.903 to .989	0.7 mm
<b>DAY 1 OVERALL</b>				
Pre-Tape	-	.938	-	0.7 mm
Post-Tape	-	.973	-	0.7 mm
<b>DAY 2</b>				
Pre-Tape	Left	.999	.997 to 1.00	0.3 mm
	Right	.997	.992 to .999	0.8 mm
Post-Tape	Left	.998	.994 to .999	0.8 mm
	Right	.998	.994 to .999	0.8 mm
<b>DAY 2 OVERALL</b>				
Pre-Tape	-	.998	-	0.6 mm
Post-Tape	-	.998	-	0.8 mm

**Table 9.** Between-Clinician Intra-class Correlation Coefficients, 95% Confidence Interval, and Standard Error of the Measure for Midfoot Width (MFW) of the Left and Right Feet.

		ICC	95% CI	SEM
<b>DAY 1</b>				
Pre-Tape	Left	.993	.979 to .998	0.9 mm
	Right	.977	.933 to .992	1.1 mm
Post-Tape	Left	.991	.974 to .997	0.7 mm
	Right	.991	.973 to .997	0.6 mm
<b>DAY 1 OVERALL</b>				
Pre-Tape	-	.985	-	1.0 mm
Post-Tape	-	.991	-	0.7 mm
<b>DAY 2</b>				
Pre-Tape	Left	.999	.997 to 1.000	0.7 mm
	Right	.999	.997 to 1.000	0.7 mm
Post-Tape	Left	.999	.997 to 1.000	0.8 mm
	Right	.999	.997 to 1.000	0.8 mm
<b>DAY 2 OVERALL</b>				
Pre-Tape	-	.999	-	0.7 mm
Post-Tape	-	.999	-	0.8 mm

---

Both of the individuals utilized in this study as clinicians demonstrated that they were equally reliable in producing a change in the height and width of the medial longitudinal arch. Although one of the clinicians (#1) had significantly more general clinical experience, the novice was equally consistent in applying the tape. Although neither clinician had a significant amount of experience using the MR6 technique, the fact that high levels of reliability were achieved without extensive experience indicates that experience is not necessary to produce consistent results. The authors therefore believe that the MR6 technique using elastic tape may be applied consistently regardless of the level of clinical experience.

The magnitude of the change seen in the height of the dorsum of the foot following the application of the MR6 taping technique averaged 3.9 mm (SD=1.2). This value is smaller than what has been reported in the literature using other taping techniques. Radford et al reported a 5.9 mm change in the height of the navicular using the low-dye taping technique.<sup>22</sup> Both Franettovich, et al and Vicenzino, et al used the “augmented” low-dye technique, which involves using inelastic tape and both the Reverse-6 plus the low-dye technique at the same time. They reported changes in the height of the medial longitudinal arch of 16 mm and 10.8 mm respectively.<sup>6,23</sup> The smaller change scores obtained in the current study may be related to the use of elastic tape or the MR6 procedure. It is also likely related to the use of subjects in the current study that did not demonstrate a significantly pronated foot posture as measured by the FPI. The mean FPI score for the subjects in the current study are indicative of only a slightly pronated foot posture using the classification proposed by Redmond.<sup>16</sup> Cornwall and McPoil found that the FPI score is positively correlated with vertical and medial-lateral foot mobility<sup>24</sup> and as such, it is likely that the current study sample had minimal vertical mobility and therefore would not have demonstrated as large of a change in the height of the medial longitudinal arch compared to those with a more pronated foot posture. It is unlikely that the smaller change in arch height is due to the use of elastic rather than inelastic tape since Abian, et al showed that elastic tape limited motion of the ankle better than inelastic tape, even after 30 minutes of vigorous exercise.<sup>25</sup>

The magnitude of the change seen in the width of the midfoot following the application of the MR6 taping technique averaged approximately 0.4 mm (SD=1.8). Franettovich et al reported previously that the traditional Reverse-6 and low-Dye taping using inelastic tape caused a significant reduction in midfoot width.<sup>23</sup> The lack of change in midfoot width in the current study may indicate that the “modified” Reverse-6 taping technique using elastic tape is either less able to alter midfoot width due to stretching of the tape during weight bearing or again, the subjects included in this study had a less mobile midfoot and therefore change was not possible. Although further research is required, it would appear that the MR6 taping technique is more effective in altering the height of the medial longitudinal arch rather than midfoot width.

Despite the inclusion of individuals with normal foot posture and mobility, the primary purpose of this study was to determine if the MR6 taping technique can be applied in order to produce a consistent change in the height and width of the medial longitudinal arch rather than determining the actual magnitude of the change that would result from its application. Further research is planned to determine the magnitude of change in the medial longitudinal arch and the duration of that change using the MR6 technique. Based upon the results of this study, a clinician can be assured that the MR6 taping procedure may be applied consistently from one treatment session to the next, after training as utilized with the clinicians who participated in this study. Furthermore, clinicians they can be assured that another person will be able to provide a similar change in either arch height or midfoot width when applying the tape in the manner described in this study. This is very important, especially in those situations where the same clinician may not be able to apply the tape at every session of a patient's treatment. These results also support investigating the use of the MR6 taping technique using elastic tape in future studies regarding its clinical effectiveness, especially if that treatment will be utilized over several days or be applied by different clinicians.

Because the current study modified the Reverse-6 taping procedure and utilized elastic tape, which is different from the procedures and type of tape used

in previously published studies<sup>4,5,8</sup>, future research needs to be performed to address the issues of medial longitudinal arch height change and width of the midfoot in those individuals who have a more mobile foot. In addition, future studies should also be conducted to assess the long-term effects of the MR6 taping procedure using elastic tape. Previous studies that have looked at how long tape will affect a change in foot posture or mobility have used inelastic tape and either the low-dye or the “augmented” low-dye technique.<sup>6,22</sup> Studies assessing the low-dye technique have reported a loss of 20% in the height of the navicular bone following a bout of exercise<sup>22</sup> with only a 12.5% loss using the “augmented” low-dye technique.<sup>6</sup> As such, it will be important for future studies to look at whether the use of elastic tape when performing either the low-dye or the “augmented” low-dye technique will result in more or less durability. In the author's clinical practice, there is anecdotal evidence that individuals prefer the elastic tape to the inelastic tape because it is more comfortable and there is less skin irritation and blister formation. As such, future research should look at this as well.

## CONCLUSION

Based upon the results of this study, the MR6 taping technique using elastic tape may be applied within the same day, from one day to the next, and between two different practitioners to produce a consistent short-term change in the height of the medial longitudinal arch. Although the MR6 taping procedure requires only minimal training, the high degree of reliability observed in the current study does not appear to be influenced by the amount of clinical experience.

## REFERENCES

1. Abd El Salam MS, Abd Elhafz YN. Low-dye taping versus medial arch support in managing pain and pain-related disability in patients with plantar fasciitis. *Foot & ankle specialist*. 2011;4(2):86–91. doi:10.1177/1938640010387416.
2. Cheung RT, Chung RC, Ng GY. *Br J Sports Med*. In: *Br J Sports Med*. Vol 45. England; 2011:743–751. doi:10.1136/bjism.2010.079780.
3. Saxelby J, Betts RP, Bygrave CJ. “Low-Dye” taping on the foot in the management of plantar-fasciitis. *The Foot*. 1997;7(4):205–209. doi:10.1016/S0958-2592(97)90037-7.
4. Franettovich M, Chapman A, Vicenzino B. Tape that increases medial longitudinal arch height also reduces leg muscle activity: a preliminary study. *Med Sci Sports Exerc*. 2008;40(4):593–600. doi:10.1249/MSS.0b013e318162134f.
5. Vicenzino B, Feilding J, Howard R, Moore R, Smith S. An investigation of the anti-pronation effect of two taping methods after application and exercise. *Gait and Posture*. 1997;5(1):1–5. doi:10.1016/S0966-6362(95)01061-0.
6. Vicenzino B, Griffiths SR, Griffiths LA, Hadley A. Effect of Antipronation Tape and Temporary Orthotic on Vertical Navicular Height Before and After Exercise. *J Orthop Sports Phys Ther*. 2000;30(6):333–339.
7. Vicenzino B, McPoil TG, Russell T, Peisker S. Anti-pronation tape changes foot posture but not plantar ground contact during gait. *The Foot*. 2006;16(2):91–97. doi:10.1016/j.foot.2006.02.005.
8. Vicenzino B, Franettovich M, McPoil TG, Russell T, Skardoon G. Initial effects of anti-pronation tape on the medial longitudinal arch during walking and running \* Commentary. *Br J Sports Med*. 2005;39(12):939–43– discussion 943. doi:10.1136/bjism.2005.019158.
9. Radford JA, Burns J, Buchbinder R, Landorf KB, Cook C. The effect of low-Dye taping on kinematic, kinetic, and electromyographic variables: a systematic review. *J Orthop Sports Phys Ther*. 2006;36(4):232–241. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/16676873>.
10. Landorf KB, Radford JA, Keenan A-M, Redmond AC. Effectiveness of low-Dye taping for the short-term management of plantar fasciitis. *J Am Pod Med Assoc*. 2005;95(6):525–530.
11. Moss CL, Gorton B, Deters S. A comparison of prescribed rigid orthotic devices and athletic taping support used to modify pronation in runners. *Journal of Sport Rehabilitation*. 1993;2:179–186.
12. Meier K, McPoil TG, Cornwall MW, Lyle T. Use of antipronation taping to determine foot orthoses prescription: a case series. *Research in sports medicine*. 2008;16(257):257–271. doi:10.1080/15438620802310842.
13. Delahunt E, O'Driscoll J, Moran K. Effects of taping and exercise on ankle joint movement in subjects with chronic ankle instability: a preliminary investigation. *Arch Phys Med Rehabil*. 2009;90(8):1418–1422. doi:10.1016/j.apmr.2009.01.024.
14. Yoho RR, Rivera JJJ, Renschler RR, Vardaxis VGV, Dikis JJ. A biomechanical analysis of the effects of low-Dye taping on arch deformation during gait. *The*

- 
- Foot*. 2013;22(4):283–286. doi:10.1016/j.foot.2012.08.006.
15. Hadley A, Griffiths SR, Griffiths LA, Vincenzino B. Antipronation taping and temporary orthoses. Effects on tibial rotation position after exercise. *J Am Pod Med Assoc*. 1999;89(3):118–123.
  16. Redmond AC, Crane YZ, Menz HB. Normative values for the Foot Posture Index. *J Foot Ankle Res*. 2008;1(6):1–9.
  17. Cornwall MW, McPoil TG, Lebec M, Vincenzino B, Wilson J. Reliability of the modified Foot Posture Index. *J Am Pod Med Assoc*. 2008;98(1):7–13.
  18. McPoil TG, Cornwall MW, Vincenzino B, et al. Effect of using truncated versus total foot length to calculate the arch height ratio. *The Foot*. 2008;18(220):220–227. doi:10.1016/j.foot.2008.06.002.
  19. McPoil TG, Vincenzino B, Cornwall MW, Collins NJ, Warren M. Reliability and normative values for the foot mobility magnitude: a composite measure of vertical and medial-lateral mobility of the midfoot. *J Foot Ankle Res*. 2009;2(6):1–12. doi:10.1186/1757-1146-2-6.
  20. Shrout PE, Fleiss JL. Intraclass correlations: uses in assessing rater reliability. *Psychological Bulletin*. 1979;86:420–428.
  21. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1977;33:159–174.
  22. Radford JA, Burns J, Buchbinder R, Landorf KB, Cook C. Does stretching increase ankle dorsiflexion range of motion? A systematic review. *Br J Sports Med*. 2006;40(10):870–5– discussion 875. doi:10.1136/bjsm.2006.029348.
  23. Franettovich M, Chapman AR, Blanch P, Vincenzino B. Augmented low-Dye tape alters foot mobility and neuromotor control of gait in individuals with and without exercise related leg pain. *J Foot Ankle Res*. 2010;3(1):5. doi:10.1186/1757-1146-3-5.
  24. Cornwall MW, McPoil TG. Relationship between static foot posture and foot mobility. *J Foot Ankle Res*. 2011;4(4):1–9. doi:10.1186/1757-1146-4-4.
  25. Abian-Vicen J, Alegre LM, Fernandez-Rodriguez JM, Aguado X. Prophylactic Ankle Taping: Elastic Versus Inelastic Taping. *Foot and Ankle International*. 2009;30(3):218–225.